

Submandibular intubation as an alternative for intra-operative airway management in maxillofacial fractures - our institutional experience

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ABSTRACT

Background and Aims: Airway management in anaesthesia for maxillofacial surgical procedures is tricky at times when the nasal/oral routes are contraindicated or are impossible. Tracheostomy as an alternative inherits its own complications. We present a case series of the submandibular route for tracheal intubation as an alternative. **Methods:** The procedure was performed in ten selected adult patients with maxillofacial/mandibular fractures associated with a fracture of skull base or nasal bone. All of them were medically stable with no need of intensive care or mechanical ventilation in post-operative period. **Results:** Submandibular intubation in all ten patients of panfacial fractures allowed uninterrupted surgical techniques with a secured airway. All patients were reverted to oro-tracheal tube at the end of surgery as immediate maxillomandibular fixation was not necessary. The patients were extubated after recovery from anaesthesia before they left the operating theatre. One patient in the post-operative period had a superficial infection of incision site that responded well to local treatment. No other complications were encountered in the intra-operative or post-operative period. **Conclusion:** In complex maxillofacial injuries, when oral or nasal intubation hampers surgeon's field of view, submandibular intubation offers an effective alternative to short-term tracheostomy along with small risk potential. There is a need to emphasise its regular application in such cases so that technique can be mastered by both surgeons and anaesthesiologist.

Key words: Anaesthesia, maxillofacial surgery, panfacial fractures, submandibular intubation

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INTRODUCTION

Maxillofacial and mandibular fracture patients are common in the emergency department of a referral hospital. Appropriate airway management is a major concern in these cases for both the anaesthesiologist and the surgeon. The standard oral/nasal route for tracheal intubation may not be suitable for Le-Fort II/III maxillary fractures^[1,2] or may not be available as a result of a deformity or fractures in the nasal bone,^[3,4] respectively. Oro-tracheal intubation may not only obstruct surgical field but can also make immediate maxillomandibular fixation impossible.^[4] An elective short-term tracheostomy just before the operation is an alternative but it is associated with its own set of complications, especially in children, or may be contraindicated in cases of cervical spine injury

patients and those with neck mass at the operative site.^[5] Alternatives such as submental^[6] or submandibular^[7] route for tracheal intubation that bypass the surgical area appear promising. We conducted this clinical observational study to demonstrate the feasibility and the reliability of submandibular tracheal intubation as an alternative method for airway management in such situations.

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METHODS

This study was conducted from June 2011 to August 2015 after getting approval by the Institutional Clinical Research and Ethical Committee. A written informed consent was obtained from each patient. Patients with cervical spine/intracranial injury, long bone fractures, hollow viscous injury, Glasgow Coma Scale <12 and those who might need mechanical ventilation in the post-operative period were excluded. Ten selected patients with maxillofacial fractures in whom conventional oral intubation was not an option for surgery or nasal intubation was contra-indicated were chosen for submandibular intubation as the elective surgical procedure. Anaesthesia protocol included premedication with intravenous (IV) midazolam 1 mg, IV glycopyrrolate 0.2 mg, IV ondansetron 4 mg and then anaesthesia was induced with IV fentanyl 2 µg/kg and IV propofol 2–3 mg/kg along with IV vecuronium as a paralyzing agent. Anaesthesia was maintained with sevoflurane and 100% oxygen till endotracheal intubation was achieved using conventional laryngoscopy technique. A levering blade and bougie were used in difficult cases while fiberoptic bronchoscope was kept standby. Anaesthesia was maintained with oxygen, sevoflurane and nitrous oxide after successful conversion of oro-tracheal route of intubation to the submandibular route. Standard intra-operative monitoring included pulse oximetry, end tidal carbon dioxide, electrocardiogram and non-invasive blood pressure with an emphasis on episodes of arterial desaturation, bradycardia during conversion of oral to submandibular intubation. The primary aim was to study two important parameters: (1) the time required for the procedure since submandibular intubation needs disconnection from anaesthetic circuit which carries the risk of arterial desaturation and (2) intra- and post-operative complications such as accidental extubation, endotracheal tube migration or haemorrhage that could have an adverse effect on patient outcome. In case submandibular intubation was difficult, elective tracheostomy or fiberoptic intubation was the standby options.

Technique

Initially, oro-tracheal intubation was performed using a prepared armoured tracheal tube along with surgical preparation of the submandibular area [Figure 1]. The side of the submandibular area preferred was governed by the presence of a mandibular fracture. A transverse skin incision of 1.5 cm was made in the



Figure 1: Patient with initial oro-tracheal intubation

submandibular area, about 1 inch below and 1/2 inch anterior to the angle of the mandible [Figure 2] thus avoiding injury to the marginal mandibular nerve. Using a curved artery forceps (pedicle clamp), blunt dissection was performed through the platysma, the deep cervical fascia and mylohyoid muscle; thus creating a tunnel in close proximity to the lingual cortex of the mandible [Figure 3] and preventing injury to the lingual and submandibular gland. Mucous membrane just medial to the second molar tooth was tented over the tip of the artery forceps and incised to allow forceps entry into the oral cavity. The connector of the armoured tracheal tube was removed and its end was grasped with the tip of the artery forceps and pulled through the dissected track to come out through the submandibular incision. The connector was replaced and breathing circuit was reconnected. The armoured tube was secured to the skin incision site [Figure 4]. The anaesthesiologist's index finger was used to support the tracheal tube in the oropharynx, while the tube was being pulled through the track. Checking the tracheal tube position before fixation was performed in all the patients.

RESULTS

All ten patients in this study were adults with age ranging from 18 to 45 years (mean 30.4 years). Eight out of ten patients had panfacial fractures with two having associated fracture of the base of the skull. Seven out of ten patients underwent additional rhinoplasty surgery. Two patients had mandibular fractures associated with midfacial fractures.

No major intra- and post-operative complications were identified in our patients. One patient had



Figure 2: Incision being taken 1 inch below right angle of jaw



Figure 3: Flexometallic tube close to lingual plate of mandible



Figure 4: Flexometallic tube sutured to skin at the incision site

post-operative superficial infection that responded well to local treatment and recovered completely after 3–4 days.

DISCUSSION

Airway management in panfacial reconstruction surgery underwent a major breakthrough when this approach was first described by Hernández Altemir^[6] in 1986. Various incision sites have been proposed since then with their own risk and benefits that are discussed ahead.

Hernández Altemir^[6] in 1986 first described submandibular intubation, a modification of submental intubation as an alternative method for short-term tracheostomy. Initially, a 2 cm submental incision at one-third of the distance between the symphysis and the angle of the mandible, lying just medial to the lower border of the mandible was used. Potential complications of this approach were damage to adjacent salivary structures and lingual nerve.

A more posterior incision in the same area was proposed that avoided injury to the important salivary structures.^[7] In our series, we followed the same approach. Safety of the procedure was enhanced by careful extra-periosteal blunt dissection in close proximity to the inner side of the mandible since the narrow subperiosteal passage is not essential.^[8,9] A strict midline submental incision though associated with satisfactory outcome, pulling the tube through the deep cervical fascia in the submandibular area may probably be easier than in the tight submental area.^[10,11] A remote possibility of interfering the surgical field, sterilisation and risk of aspiration that may occur due to intra-operative exchange from nasal to oral tube is avoided by submandibular intubation.^[11]

Hypoxia is a potential risk that may be encountered while passing the tube through the incision. To overcome this, use of two tubes has been suggested, a conventional oro-tracheal tube securing the patient's airway, whereas a second armoured tube passing through the incision from the exterior to interior and then into the trachea just after the removal of the first tube using Magill forceps.^[12] Careful removal of fixed connector by artery forceps can create an appropriate fitting removable connector. More recently, armoured tubes having detachable connector attachment are available making it ideal for submandibular tracheal intubation.^[13]

The direction of the mucocutaneous track is also important. A track from oral to skin surface carries the

risk of mucocoele formation secondary to entrapment of mucosal fragments in track.^[14] Complications such as accidental dislodgement of the tube to the right main bronchus^[11] and accidental extubation and inward displacement of the tube^[15] were not encountered in our experience.

Early post-operative airway concerns such as oedema, haematoma and low level of consciousness are real.^[16] Extubation may therefore be delayed until the patient is fully awake and oedema has subsided to ensure airway protection. In general, the endotracheal tube through this route is kept for <72 h due to the fear of laryngeal damage or pneumonia.^[17] At the end of the procedure, it is recommended to switch the tube to the oral route because the major concern is the easy accessibility to the airway in the post-operative period.^[18] In our series, we did not come across complications such as salivary duct injury, lingual nerve paraesthesia, mucocele formation probably because of a small sample size, lack of blinding, randomisation and less severe injuries in the patients chosen. As a result, we cannot be sure regarding the absolute safety of this procedure.

In our series, the use of rigid plate fixation rendered immediate post-operative maxillomandibular fixation unnecessary while on the contrary, some authors have recommended submandibular tracheal tube rather than oro-tracheal one in the post-operative period as it appears to be better tolerated by the patient with easy fixation in addition to avoiding the risk of disruption of the surgical reconstruction if the patient accidentally bit on the oral tube.^[19]

Intra-operative early complications related to tracheostomysuchas loss of airway, arterial desaturation, haemorrhage, pneumomediastinum, pneumothorax and recurrent laryngeal nerve damage range between 6% and 8%. The incidence of late complications related to tracheostomy is as high as 60% including stomal and respiratory tract infections, tracheal stenosis, trachea-oesophageal fistula and unaesthetic scar.^[18] The role of tracheostomy was questioned in cases of re-construction of panfacial injury and has been replaced by submandibular/submental intubation.^[19,20] These procedures were recently evaluated and were found to be simple technically and favoured by maxillofacial surgeons due to fewer complications related to these techniques.^[17,21] Overall, the technique used in this study proved to be optimal both for surgeon and anaesthesiologist with respect to surgical

access and patient's airway safety, respectively. It also avoided the poor aesthetic appeal and stigma associated with tracheostomy.

CONCLUSION

In patients with complex maxillofacial injuries undergoing corrective surgery, when oral or nasal intubation is not possible or acceptable, submandibular intubation is an effective and acceptable alternative technique to short-term tracheostomy and is associated with small risk potential. There is a need to emphasise its regular application in such cases so that technique can be mastered by both surgeons and anaesthesiologist.

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Conflicts of interest

There are no conflicts of interest.

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